THE EFFECT OF THE MODIFIED CORT PROGRAMME IN ENHANCING CRITICAL THINKING AND IMPROVING MOTIVATION TO LEARN AMONG STUDENTS WITH LEARNING DIFFICULTIES IN MATHEMATICS

By

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DEDICATION

I dedicate this humble work to the springs of loyalty, affection and virtue, my loyal companion, my wife, Abeer, who has always been there for me; to my dear children Raneem, Leen; and Yaman.

Tareq Melhem

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LIST OF ABBREVIATIONS AND ACRONYMS

LDs: Learning Difficulties in mathematics.

CoRT: Cognitive Research Trust

MCoRTP: The Modified CoRT Programme.

CT: Critical Thinking.

CTT: Critical Thinking Test.

MLT: Motivation to Learn.

QMTL: Questionnaire of Motivation to Learn.

NCLD: National Centre for Learning Difficulties.

MoE: Ministry of Education.

MoHE: Ministry of Higher Education.

MSD: Ministry of Development.

DGS: Department of General Statistics.

KEBERKESANAN PROGRAM CoRT YANG TELAH DIUBAH SUAI DALAM MENINGKATKAN PEMIKIRAN KRITIKAL DAN MOTIVASI UNTUK BELAJAR DALAM KALANGAN PELAJAR BERMASALAH PEMBELAJARAN YANG MEMPUNYAI MASALAH PEMBELAJARAN DALAM SUBJEK MATEMATIK

ABSTRAK

Tujuan kajian ini adalah untuk membina satu program latihan berdasarkan program CoRT dan menilai keberkesanannya dalam meningkatkan pemikiran kritikal dan motivasi untuk belajar bagi pelajar tahun enam yang mempunyai masalah pembelajaran dalam subjek matematik di Jordan.Reka bentuk kumpulan kawalan untuk ujian pra dan pos yang merupakan satu pendekatan popular untuk penyelidikan statistik kuasi-eksperimen telah digunakan dalam kajian ini, pemboleh ubah yang dimanipulasi adalah program CoRT yang telah diubah suai didedahkan kepada kumpulan eksperimen, manakala kumpulan kawalan pula tidak menerima sebarang latihan.Terdapat dua pemboleh ubah bergerak balas dalam kajian ini iaitu tahap kemahiran pemikiran kritikal pelajar dan motivasi mereka untuk belajar.Dua instrumen telah digunakan iaitu ujian pemikiran kritikal yang menilai tahap pemikiran kritikal pelajar dan soal selidik untuk menilai tahap motivasi pelajar untuk belajar.Instrumen-instrumen ini telah digunakan ke atas sampel kajian dalam kedua-dua ujian pra dan pos. Sampel kajian terdiri daripada 93 orang pelajar tahun enam dari sekolah-sekolah di **First Amman Educational Directorate, Jordan**.Para peserta sampel kajian diagihkan kepada dua kumpulan.Kemudian, satu kumpulan telah dipilih secara rawak untuk menjadi kumpulan eksperimen dan satu lagi sebagai kumpulan kawalan. Seramai 43 pelajar (lelaki=21, perempuan=22) menerima program CoRT yang telah diubah suai, manakala 50 pelajar (lelaki=25,

perempuan=25) lagi tidak menerima sebarang latihan. Semua pelajar yang terlibat mengalami masalah pembelajaran dalam subjek matematik sahaja dan telah mendaftar di bilik sumber pembelajaran di sekolah-sekolah harian biasa.Kajian ini menggunakan kaedah kuantitatif. Analisis data yang dikumpul telah dijalankan dengan menggunakan analisis kovarians (Cara 1 dan 2 ANCOVA) untuk menilai keberkesanan program latihan dalam meningkatkan tahap pemikiran kritikal dan meningkatkan tahap motivasi untuk belajar. Hasil kajian menunjukkan bahawa program latihan mempunyai keberkesanan yang bersaiz sangat besar terhadap pemikiran kritikal peserta dan motivasi untuk belajar.Jantina didapati mempunyai kesan yang besar terhadap pemikiran kritikal pelajar dan motivasi untuk belajar dalam ujian pos, apabila kesan hasil kajian ujian pra dalam ujian pemikiran kritikal dan soal selidik motivasi pelajar untuk belajar dikawal. Walau bagaimanapun, interaksi antara jantina dan perbezaan ketara kumpulan didapati memihak kepada pelajar lelaki dalam ujian pos bagi ujian pemikiran kritikal, apabila kesan ujian pra dalam ujian pemikiran kritikal pelajar dikawal.Manakala, pelajar perempuan mendahului pelajar lelaki dalam ujian pos bagi soal selidik motivasi untuk belajar, apabila kesan ujian pra dalam soal selidik motivasi pelajar untuk belajar dikawal.

THE EFFECT OF THE MODIFIED CoRT PROGRAMME IN ENHANCING CRITICAL THINKING AND IMPROVING MOTIVATION TO LEARN AMONG STUDENTS WITH LEARNING DIFFICULTIES IN MATHEMATICS

ABSTRACT

The purposes of this study were to construct a training programme based on the CoRT programme and to measure its effects in enhancing critical thinking (CT) and improving motivation to learn for sixth grade student with Learning Difficulties (LDs) in mathematics in Jordan. The pre-test-post-test control-group design, which is a popular approach to the quasi-experimental statistical research, was used in the study, in which the independent variable was the modified CoRT programme (MCoRTP) exposed to the experimental group, while the control group was not given any training. There were two dependent variables in this study, namely, the level of students' CT skills and their motivation to learn (MTL). Two instruments were used, a critical thinking test (CTT), which assessed the students' level of critical thinking, and a questionnaire for assessing the level of their MTL. These instruments were applied to the sample of the study as both pre-test and post-test. The sample consisted of 93 sixth-grade students from schools in First Amman Educational Directorate in Jordan. The participants of the sample were distributed into two groups. After that, one group was randomly chosen to be the experimental group, and the other one to be the control group. A total of 43 (male=21, female=22) students received the MCoRTP, while 50 (male=25, female=25) did not receive any training. All the students had LDs in mathematics only and were enrolled at learning resources rooms in regular schools. This study used quantitative method. The collected data analyses were carried out using analysis of covariance (1 and 2 way ANCOVA) to

measure the effects of the training programme in enhancing the level of CT and improving the level of MTL. Results showed that the training programme had a very large -sized effect on the participants' CT and MTL. Gender was found to be of significant effect on the participants' CT and MTL in the post-test, when the effect of the pre-test results of the CTT and questionnaire of the MTL of the students is controlled. However, the interaction between gender and group significant differences were found favouring to the male students in the post-test of the CTT , when the effect of the pre-test results of the CTT of the students is controlled. While the pre-test was controlled, the score of female students exceeded the male students in the post-test of the MTL.

CHAPTER 1

INTRODUCTION

1.1 Introduction

This study aims to investigate the teaching of thinking skills based on the MCoRTP among students with LDs in mathematics, and focused on the effect of the MCoRTP in enhancing critical thinking (CT) as well as improving motivation to learn (MTL) among students with LDs in mathematics from the primary sixth grade students in Jordan. The gender of the students was also considered. The first chapter of the study presents the background of the study, which explores specific problems, objectives, research questions, hypotheses, significance of the study, and the limitations.

Development of thinking is considered one of the main objectives that most educators seek to achieve. Once these objectives are achieved, students are able to effectively address issues and crises in everyday life as well as the complications of the present and future. The process of thinking is considered similar to the human breathing apparatus because it is as indispensable as breathing. Teaching thinking skills is necessary because of the breadth of knowledge available. Thinking skills provide the necessary tools to address this avalanche of renewable knowledge that has been witnessed in our contemporary world (Jarwan., 2007).

The notion that thinking could be taught, or at least nurtured fruitfully along its way, had been being discussed for centuries. During the eras of Plato and Socrates, attention to improving intelligence and promoting effective thinking was a recurring educational trend (Ritchhart & Perkins, 2005). In line with that, Ritchhart and Perkins (2005) reported that:

> Early in the twentieth century, Dewey (1933) again focused North American's attention on the importance of thinking as an

> educational aim. At the same time, Selz (1935) was advocating the idea of learnable intelligence in Europe. In the 1970s and 1980s, specific programme s designed to teach thinking took shape, many of which continue in schools today. Efforts to teach thinking have proliferated in the new millennium, often becoming less programmatic in nature and more integrated within the fabric of schools. **(**pp. 775)

Most countries today are interested in increasing educational standards and emphasizing on teaching basic skills. However, basic skills alone are not sufficient to meet the demand of the market. Therefore, there is an urgent need to focus on higher-order thinking skills because most individuals are unable to retain the tremendous amounts of information in their memory to be used or retrieved in the future. The vast breadth of knowledge available and the need for modern society to meet the needs of effective citizens also raises the urgency for teaching thinking skills.

The new challenge for the development of educational and pedagogical curricula is the needs to provide programmes on teaching thinking processes to all individuals and not just for an elite group (Larsen, 2002). Therefore, the supreme objective of education in the twenty-first century is the development of thinking in all its forms for all individuals. Thus, the role of the educational institution has grown to prepare and enable individuals to solve unexpected problems. Accordingly, schools must provide students with the proper tools and proper thinking process that they can use to deal with multiple and diverse situations that they may encounter. Consequently, serious decisions on current affairs issues is an enormous responsibility to bear (Cotton, 1991).

1.2 Nurturing General Thinking

The issue of nurturing thinking in general seems clear in previous studies that have addressed the function of education, starting with Dewey, to Skinner, Piaget, Ericsson, Froebel, and others. Hullfish and Smith (1978) pointed out the importance

of thinking by stating that students learn how to think. They further indicated the uncertainty of continuing their education if they did not learn this at schools.

In the same context, Patel (2010) concluded a general consensus among researchers who have addressed the subject of thinking and found that thinking and creating exciting opportunities for reflection are two significant matters. Thus, thinking should be the primary objective of educational institutions that serve as supplier of tools and knowledge for students, who need academic arsenals to allow them to interact effectively with any information or variables that they may face in the future. Therefore, acquiring education and teaching thinking have become increasingly important for the success of the individual and the development of society.

Nevertheless, inserting the teaching of thinking skills at schools, regardless of their educational and practical importance, is an issue of concern in the question of growth, progress, and challenges of the future (Berryman, 1987). Reed and Kromrey (2001) stated that the need for intellectual people, qualified labour force, as well as the ability to use higher thinking skills such as critical thinking, have been and will continue to be matters of debate and interest since the time of Socrates to the present. These findings are considered important and necessary for education. Dewey and Boydston (1985) emphasized that the learning of thinking should be the main purpose of education.

Although thinking is considered a daily process that accompanies human lives, life in the past was simpler and did not require addressing complicated issues. In fact, the decisions to solve life issues was once religiously oriented. Verdicts on crises were based on beliefs, culture, and dogma, and were used as a rule of thumb form of ruling to overcome disputes (al-Manea, 1996). On the contrary, the world

nowadays is bombarded with turbulent affairs, people are no longer settled, and customs and habits have been altered by the extravagant changes in technologies and social aspirations. Thus, evolution of new methods of thinking to face these complicated problems is desperately needed (al-Manea, 1996).

Beyer (1988) indicated that teaching thinking enhances the chances for communities and individuals to coexist in a world of rapid changes in all aspects of life because teaching how to think currently became a common goal in the world.

1.2.1 Nurturing Thinking In Students With LDs

Great developments and evolution in the educational field have also posed new challenges, including teaching students with LDs. Observers of this enormous evolution have noted that teaching thinking and solving problems has concentrated mainly on ordinary students, where students have become the axis of the educational process; thus traditional education became something of the past because it failed to keep pace with the requirements of the modern age.

Despite the importance of thinking skills to aid individuals in adjusting to society's requirements, realizing self-esteem levels and motivation, teaching thinking to students with LDs has been grossly neglected in several programmes, and failure to continue with real implementations (Agran, Blanchard, Wehmeyer, & Hughes, 2002).

Recently, it can be observed that in publication of several studies in the field of education that address teaching thinking and solving problems in addition to cognitive strategies and their effect in improving several aspects of education for talented students in general, and for ordinary students in particular. Nevertheless, only a few of these studies have addressed teaching of thinking to students with LDs because of the prevalent belief in the field of special education that students with LDs

have a more urgent need to master basic skills, such as learning to read and write. Thus, teaching thinking skills is not considered a priority in the field of special education (LaFrance, 1995; Leshowitz, Jenkens, Heaton, & Bough, 1993; Rottman & Cross, 1990). Special education stakeholders today are required to insert higher-order thinking skills within the curriculum for students with special needs, a challenge that has been met with an outcry from special education teachers because they believe their students are still struggling to pass the regular curriculum (Carnine, 1991). Thus, it is still argued whether teaching thinking skills among LDs should be prioritized above the basic skills.

Students with LDs are considered to need to learn thinking strategies the most because their difficulties inhibit them from using effective thinking strategies as compared with ordinary students (Swanon & Stomel, 2012). In other words, it is expected that with more effective thinking strategies, they would likely to be able to pass the regular curriculum.

Rottman and Cross (1990) and Swanon and Stomel (2012) pointed out that students with LDs are unable to use thinking strategies spontaneously because they are unable to adapt to their behaviour in the same way as ordinary students can because they possess the skill of self-control, and thus, they need to learn to use thinking strategies to facilitate their comprehension as well as working on how to utilize their training to deal with sudden crises.

Different programmes have been offered to improve learning of students with LDs on an international level and these programmes continued to evolve over the years. These programmes currently concentrate on training students with LDs on basic academic skills, but recent changes have shifted the focus on teaching higher thinking skills as specialists in the field of special education have begun to search for

possibilities of training several special education categories on different kinds of thinking as shown by the current crop of studies on the area (Carnine, 1991; Mastropieri et al., 1996).

In line with that, although educational thinking programmes have increasingly focused on gifted and ordinary students, some attention has also been given to teaching of thinking in general to students with special needs, particularly students with LDs (LaFrance, 1995; Leshowitz et al., 1993; Rottman & Cross, 1990).

Studies have found remarkable success in training students with LDs on specific cognitive strategies. For instance, Ellis inserted four thinking strategies into curriculum of student with LDs, including Orienting Process, Framing Process, Applying Process, and Generalization Process (Scruggs & Mastropieri, 1993). Shondrick, et al. (1992) conducted a study on a sample of ordinary students and students with LDs from the third and fourth grades and found that the performance in creative testing and ability to solve problems of those students with LDs were less than that of ordinary students, highlighting the need for students with LDs to be taught thinking skills to upgrade and improve their academic levels and consequently their lives.

1.3 Background Of The Study

A review of the issues related to the category of students with LDs, particularly in the areas of thinking skills and MTL is important to gain a better understanding of the context of the study. Increasing interest in the field of special education can recently be felt all over the Arab world in general, and the category of students with LDs in particular. Arab universities have begun to offer specializations in this field on the level of B.A. and M.A. degrees. Therefore, students with LDs have begun to find teachers who are ready to assist them in regular schools with

resource rooms that offer special services to this segment of learners. Hence, the interest started to qualify teachers for this segment to enable them to deal with special needs learners in ordinary classes. At the same time, a number of researchers have conducted studies that deal with students with LDs.

Recently, interest has shifted towards improving the thinking skills and MTL of students with LDs. This new perspective has become the main goal of practical education by using effective teaching strategies and enhancing awareness towards student-centred learning, instead of basic skills. In this regard, Lerner (2003) indicated that students with LDs have normal mental abilities. Therefore, no impediments exist to train them on thinking skills, particularly for students who have a pressing need to learn strategies of thinking to help them facing their problems in life.

Some literatures and previous studies (Al-Khatib., 2001; Carnine, 1991; Grossen, 1991; LaFrance, 1995; Lerner, 2003; Leshowitz et al., 1993; Montague, Warger, & Morgan, 2000; Scruggs & Mastropieri, 1993; Shondrick et al., 1992; Swanon & Stomel, 2012; Swartz, Kiser, & Reagan, 1999) emphasized the importance of teaching thinking skills and strategies for students with LDs to facilitate their understanding for academic subjects and meet the issues they face in their daily lives.

Accordingly, Rottman and Cross (1990) found that students with LDs lacked the skill of self-control. Therefore, they cannot use thinking strategies spontaneously as others students and need to learn thinking strategies to facilitate comprehension and work to transfer the training impact to new situations. Supporting the previous statements, Shondrick, et al. (1992) reported that based on a sample of ordinary students and students with LDs, performance of students with LDs in the creativity testing, particularly their abilities to solve problems and deductive reasoning, were

less than that of ordinary students, indicating that these students with LDs desperately need to learn thinking skills to upgrade and improve their academic lives.

Research efforts by the Jordanian Ministry of Education clearly showed that Jordanian students with LDs also need to develop their thinking skills and strategies in the same manner as ordinary students (Centre, 1987). Numerous studies (for example: Alqemish, Aladialeh, & Alturkey, 2007; Amro, 2002; Farhan, 2002; Larsen, 2002; Monahan, 2000) revealed a weakness in thinking skills and strategies in students with LDs.

In the framework of MTL, Earnest (1995) indicated that primary school children who suffer from LDs exhibit low academic self-organization and are vulnerable to motivation with regard to academic achievement compared with ordinary students. In line with that, many people with LDs have difficulty in accomplishing daily basic things, such as shopping, filling in a job application, and even in finding friends (Liz, 2012). People with LDs sometimes show emotional and behavioural problems, which impact their achievement in school and their academic self-concept. These problems alter, weaken, and lower their academic self-confidence and self-esteem. These negative consequences have urged educators to provide educational programmes to improve and tackle the crises (Moore. & Laurel, 2003).

The issue of stimulating motivation for learning among students is considered one of the crucial issues in learning. This matter has led researchers to discuss the processes of thinking (cognitive and meta-cognitive) and emotions that evolved from such stimulus. Researchers have also investigated the various learning strategies and its dimensions including thinking processes, emotions, and motivation. If these are taught to students, increases in mental processes could occur that stand behind

motivation and learning and enable these individuals to have more control over their self-learning ability.

In the same context, Shahrori (2006) and McCombs (1998) reported that the contemporary approaches in the field of learning and motivation, including the fact that effective learning depends on management and of the learning process by the learners means that the learners must have concepts, skills, and learning strategies necessary to generate motivation.

Most studies indicated that students in general (and especially students with LDs) lack of necessary motivation skills. Thus, qualified and effective programmes are urgently needed to address this issue and to address the development of cognitive and meta-cognitive skills and the emotional issues that accompany it, to allow students to develop studying skills by self-practice and conditioning. However, proficiency might not be achieved easily unless continuous training of effective methods is maintained.

Educational literature has indicated that in various skills, students will not achieve much unless direct training is provided (McCombs, 1998). Accordingly, students with LDs are in dire need for motivation, proper thinking skills and keen thinking process. If such obligations are ignored, inadequacy of self-esteem, self-assurance, and the appropriate strategies will emanate, and it leads to difficulties in dealing with life's issues and coping with daily affairs.

The increase in knowledge has led to the cognitive theory which focuses on teaching thinking skills in general, enabling students with LDs to learn them along with students with ordinary mental capabilities (Montague et al., 2000). In the light of the aforementioned discussions, this study aims to train on the CoRT programme

that teaches learning thinking skills for the development of CT skills and stimulate motivation among students with LDs.

Compatible programmes need to be integrated with contemporary orientations in educational system in Arab world. Especially because knowledge revolution and cultural openness are no longer alien in the area since the knowledge revolution as the result of the tremendous progress in communication aspiration, media, different upbringing of the new generation, and information technology.

Students in the Arab world need to be taught thinking and acquire thinking skills directly. Although the topics of education evolution and development of students' thinking has become the centre of attention, a great deal of work and commitment are still highly required in order to have a successful reformation. Institutions and trained personnel in the Arab world lack the means to develop thinking skills in schools (al-Manea, 1996).

Accordingly, this study seeks to contribute by putting forth solutions to educational problems that affect students with LDs by providing one of the modern global programmes used to develop thinking skills in students known as the Cognitive Research Trust (CoRT) Thinking. Cognitive Research Trust is an institution affiliated with the University of Cambridge that was established by De Bono in 1969, which conducting research on cognitive knowledge, issues regarding the mind, and the understanding of the thinking process.

The CoRT programme is considered one of the most famous programmes that have emerged in the field of education, and plans have been made to design and prepare programmes to be used and taught in schools. The CoRT programme is considered one of the largest thinking teaching programmes in the world that has experienced resounding success, and has been translated into several languages and

applied in many schools all over the world (E. De Bono, 2001). In terms of its success, Kessel (2008) put the following statement:

> The CoRT Thinking Programme represents the most comprehensive approach to the teaching of thinking. It includes generative and creative thinking, operational and constructive thinking. It is used for children and adults across ability levels. When used in any kind of classroom, it affects positive change in the learning environment. The thinking skills are taught and provided to pupils not only with tools to improve their academic records, but also to give them real life skills. (pp. 115–116)

Kessel (2008) also emphasized that

> Success in using the CoRT tools does not depend on prior knowledge, a great memory, or reading or writing skills. Students of varying abilities benefit from CoRT, including special education students, gifted and talented students, ESL students, and at-risk youth. (pp. 116)

1.4 Statement Of The Problem

Recently, many researchers have been conducted in "learning difficulties" (Lerner, 2003). Nevertheless, most of these researches concentrated on discussion of psychology of learning, which lacks a connection to concrete content in mathematics. Despite some researchers stated that learning difficulties are an important subject in the research area (Mercer, Mercer, & Pullen, 2010), which are still few in research that focuses on students' learning difficulties in mathematics. Particularly, there lack effective thinking strategies to improve struggling students in their mathematics learning processes. Therefore, it is necessary to apply proper of thinking strategies to improve their learning (Wang, Du, & Liu, 2009).

The provenance of the problem in this study is the reality experienced by most students with LDs in mathematics in the Arab region generally, and in Jordan particularly. Students continue to suffer from many problems, including the use of traditional educational programmes. These educational programmes focused mainly

on basic skills such as reading, writing, and mathematics skills when the obstacles of learning are actually disorders in thinking and information processing.

Moreover, no strategies and thinking skills have been used to suit different educational situations. All these problems and other obstacles raise the need to expand studies on the subject, increase appetite for more learning strategies, and improve thinking skills and in turn improve their learning and develop their MTL which is the cornerstone of the learning process. Many educational researchers have indicated the importance of programmes that teach thinking and the impact they have on improving students and learning in general.

Same tone was also reported on various studies on the subject including Arabic studies that applied CoRT teaching programme on ordinary students (Al Zyoudi, 2009; Alqemish, Aladialeh, & Alturkey, 2007; Bashiwh, 2004; Cotton, 1991; Lerner, 2003; Patel, 2010; Ritchie & Edwards, 1996). In the past few years, learning thinking programmes have been used for gifted and ordinary students, and only few programmes have been utilized for students with LDs (LaFrance, 1995; Leshowitz et al., 1993; Rottman & Cross, 1990).

Swanon and Stomel (2012) emphasized that students with LDs are considered in more than one category of special education and require training programmes to learn thinking strategies because the inability of these students to use effective thinking strategies such as those used by ordinary students. Furthermore, despite their ability to learn these strategies, they feel ashamed to apply them because the manner in which they were provided to them was inappropriate and demeaning. Rottman (1990) also indicated that students with LDs are low in self-control skills. Therefore, they cannot use thinking strategies as spontaneously as others students do. Thus, they

need to learn thinking strategies to facilitate their comprehension of events and use their learning material in their daily lives.

In line with that, Alqemish, et al. (2007) and Shondrick, et al. (1992) reported that the lack of learning skills among students with LDs led to failure of the learning process as a whole. Thus, appropriate thinking strategy must introduced and trained in order to rescue these learners.

Many education experts have pointed out the importance of the programmes of teaching thinking in improving students learning skills (Bashiwh, 2004; Cotton, 1991; Kessel, 2008; Lerner, 2003; Patel, 2010). By the same token, studies have also found remarkable success in training students with LDs in mathematics on specific cognitive strategies (Scruggs & Mastropieri, 1993). Accordingly, Lerner (2003) stated that students with LDs in mathematics have normal mental abilities and thus, no impediments exist to train them in thinking skills, especially students who have a pressing need to learn thinking strategies.

The process of basic learning equals to thinking process, and thinking process employs transformations of cognitive acquiring from a mental inactivity to a mental activity which leads to the mastering of cognitive content and to link the elements to each other (Jarwan., 2007). In this context, Sorour (2000) emphasizes that critical thinking skills gains the student a deeper understanding of the cognitive content of the subject material, in addition to activating subject continually. In this sense, Barry (2001) asserts that the various education programs should develop thinking skills because they help in the development of their different cognitive abilities.

The second problem in the study is the MTL. Students with LDs in mathematics are characterized by their weak MTL because of the accumulated failure experiences that they have encountered in their lives due to the ineffective strategies.

Furthermore, it was reported that individuals with LDs have more tendencies to develop despair attitudes toward learning, especially when the tasks require mental thinking, problem-solving skills, and higher mental processes; thereby, these students appear to be helpless until someone guide them in academic life and life in general. These behavioural mishaps are attributed to the weakness of MTL, which results in the lack of confidence, skills, and capabilities (Al-Khatib., 2001; Lerner, 2003; Mercer et al., 2010).

Supporting the aforementioned statements, Earnest (1995) reported that the primary school students who have LDs in mathematics are characterized by less academic self-organization and weak motivation to obtain academic achievement. Mokhtari and Reichard (2002) indicated that training students on thinking skills could help improve their desire to raise the level of their academic achievement (motivation-to-learn).

To sum up:

1. Teaching thinking has become an urgent need in the contemporary world.
2. Insertion of thinking skills in curriculum of students with special needs is becoming the next challenge for special education stakeholders.
3. Students with LDs in mathematics have normal mental capabilities but have been provided with very few learning thinking programmes.
4. Teaching thinking programmes can contribute to the development of learning strategies and the improvement of self-awareness among students with LDs in mathematics.
5. Teaching thinking programs can contribute to the increment of MTL and improvement of attitudes toward learning among students with LDs in mathematics.

1.5 Purpose Of The Study

Each student should be given a chance to learn thinking skills with an assumption that thinking skills can be developed. This study explores the question of whether the CoRT programme can enhance CT skills and improve MTL for students who have LDs in mathematics. It is expected that as a consequence of this research, students with LDs will obtain proper access to thinking opportunities in their schools. With the development of their learning abilities, students with LDs in mathematics might independent learners and thinkers who are capable of resolving open-ended problems. The purposes of the present study are as follows:

1. To develop a new modified version of the CoRT programme to teach thinking and transform it into an appropriate visual programme for students with LDs in mathematics in a practical context;
2. To train participants in the use of the new modified version of the CoRT programme for an entire semester and re-evaluate their CT levels using a CTT adapted by the researcher from Dardour (2001) to determine the level of development in the participants; and
3. To investigate the effectiveness of the new modified version of the CoRT programme on the motivation towards learning and educational progress of the participants through a pre- and post-test. (Questionnaire of MTL adapted from Suleiman (1989)).

The purpose of the present study is to verify whether the new modified version of the CoRT programme can develop CT skills and MTL in Jordanian sample of sixth grade students with LDs in mathematics who study in controlled learning facilities and resource rooms in ordinary schools and determine whether there statistical significant differences exist between the experimental group of students

and ordinary ones in the CT skills and MTL based on the measurement scales created for this study.

1.6 Objectives Of The Study

The present study seeks to achieve the following objectives:

1. To develop a new modified version of the CoRT programme appropriate for enhancing CT skills and improving MTL among students with LDs in mathematics.
2. To investigate whether students with LDs in mathematics have enhanced their CT skills level after the implementation of the MCoRTP due to the group factor.
3. To investigate the statistical differences in the level of enhancement of CT skills due to participant's gender.
4. To investigate the statistical differences in the level of CT skills enhancement due to interaction between factors (gender and group).
5. To investigate whether the MTL of students with LDs has improved after the implementation of the MCoRTP due to the group factor (Experimental & Control).
6. To investigate the statistical differences in the level of MTL enhancement due to participant's gender.
7. To investigate the statistical differences in the level of MTL improvement due to interaction between factors (gender and group).

1.7 Research Questions

Based on the aims of the study given above, the research questions of the study are as follows:

1. Does the MCoRTP have a significant main effect in enhancing CT among students with LDs in mathematics, when the effect of the pre-test results of the CTT is controlled?
2. Does a significant main effect exist in the level of CT skills enhancement due to the group factor (Experimental & Control) on the post-test results of the CTT, when the effect of the pre-test results of the CTT is controlled?
3. Are statistically significant differences present in enhancing the level of CT skills due to the participant's gender based on the post-test results of the CTT when the effect of the pre-test students' results on CTT is controlled?
4. Do statistically significant differences occur in enhancing the level of CT skills due to interaction between factors (gender and group) based on the post-test results of the CTT, when the effect of the pre-test results of the CTT is controlled?
5. Does the MCoRTP have a significant effect in improving MTL among students with LDs in mathematics when the effect of the pre-test results the MTL test is controlled?
6. Is a significant main effect present in the level of MTL improvement due to the group factor (Experimental & Control) on the post-test results of the MTL test when the effect of the pre-test results of the MTL test is controlled?
7. Do statistically significant differences exist in improving the level of MTL due to participant's gender on the post-test results on MTL test when the effect of the pre-test results of the MTL test is controlled?

8. Are statistically significant differences present in improving the level of MTL test due to interaction between factors (gender and group) of the post-test results on MTL test when the effect of the pre-test results of the MTL test is controlled?

1.8 Research Hypotheses

1. MCoRTP has no significant main effect in enhancing CT among students with LDs in mathematics, when the effect of the pre-test results of the CTT of the students is controlled.
2. The group factor (Experimental and Control) has no significant main effect in the level of CT skills enhancement on the post-test results of the CTT when the effect of the pre-test results of the CTT is controlled.
3. Gender of the participants did not cause statistically significant differences in enhancing the level of CT skills based on the post-test results of the CTT, when the effect of the pre-test results on CTT is controlled.
4. Interaction between factors (gender and group) has no statistically significant differences in enhancing the level of CT skills on the post-test results of the Critical Thinking, when the effect of the pre-test results of the CTT is controlled.
5. MCoRTP has no significant main effect on the improvement of MTL among students with LDs in mathematics, when the effect of the pre-test results of the MTL test is controlled.
6. Group factor (Experimental and Control) has no significant effect in the level of MTL improvement based on the post-test results of the MTL test when the effect of the pre-test results of the MTL test is controlled.
7. No significant statistical differences occur in the improvement of the level of MTL due the gender of participants based on the post-test results of MTL test when the effect of the pre-test results of the MTL test is controlled.

8. No significant statistical differences occur in the improvement of the level of MTL due to interaction between factors (gender and group) based on the post-test results of the MTL test when the effect of the pre-test results of the MTL test is controlled.

1.9 Conceptual Framework

In reference to the objectives and research questions, the conceptual framework is developed involving the three variables: the MCoRTP, CT skills and MTL that are complementary to one another. The conceptual framework of this study is a milestone plan intended to show the relationship between the research questions to answer.

The conceptual framework (Fig. 1.1) highlights some aspects that are relevant in CoRT program to teach thinking skills for the students. The first stage involves the preparatory stage. During this stage, MCoRTP is developed to incorporate knowledge about enhancing CT and improving MTL among students with LDs in mathematics. Since the focus of the study is on enhancing CT and improving MTL, the MCoRTP will be prepared comprising of 23 training sessions, the initial 3 sessions are for students with LDs in mathematics to understand the training program; and introductions about thinking; CoRT program; CT. The 20 other thinking tools of MCoRTP sessions which are ideas processing (good - bad – new), considering all factors (think of all ideas), rules – instructions, consequences (what will happen if..?), objectives (goals and desired achievements), planning (action steps), the most important things, alternatives and possibilities, decision-making and the point view others.

The next stage is the implementation stage involving practical application of MCoRTP sessions which are Ideas Processing (Good - Bad – New), Considering All

Factors (Think of All Ideas), Rules – Instructions, Consequences (What will happen if..?), Objectives (Goals and Desired Achievements), Planning (Action Steps),The Most Important Things, Alternatives and Possibilities, Decision-Making and The Point View Others. Throughout the implementation period, the trained student with LDs will use the thinking skills in training kit be applied in their academic lives and life in general. The child will do all the 20 MCoRTP sessions which are Ideas Processing (Good - Bad – New), Considering All Factors (Think of All Ideas), Rules – Instructions, Consequences (What will happen if..?), Objectives (Goals and Desired Achievements), Planning (Action Steps),The Most Important Things, Alternatives and Possibilities, Decision-Making and The Point View Others.

The sessions in the MCoRTP are intended to enhance CT and improve MTL. All sessions proposed by the researcher can be carried out any place- indoors. The worksheets in the MCoRTP are mere suggesting and teachers can come up with innovation worksheets as long as it draws the interest and attention of the students with LDs. The CT skills start with a lower difficulty level moving on to more challenging ones. By the time the student with LDs in mathematics go to school, it is hoped the student with LDs in mathematics will be ready to face any difficult situation and be able to solve it all by itself by using what he / she has of critical thinking skills with motivation.

The final stage is the evaluation stage. After an intensive implementation period of 16 weeks, the student's CT and MTL changes will be noted in consultation with the teacher- the student's trainer. In this stage, all students of resultant changes will be recorded and compared to the student in the pilot study. The changes expected may be enhanced CT and improved MTL. The CTT and questionnaire of MTL will be used for the evaluation in this stage.

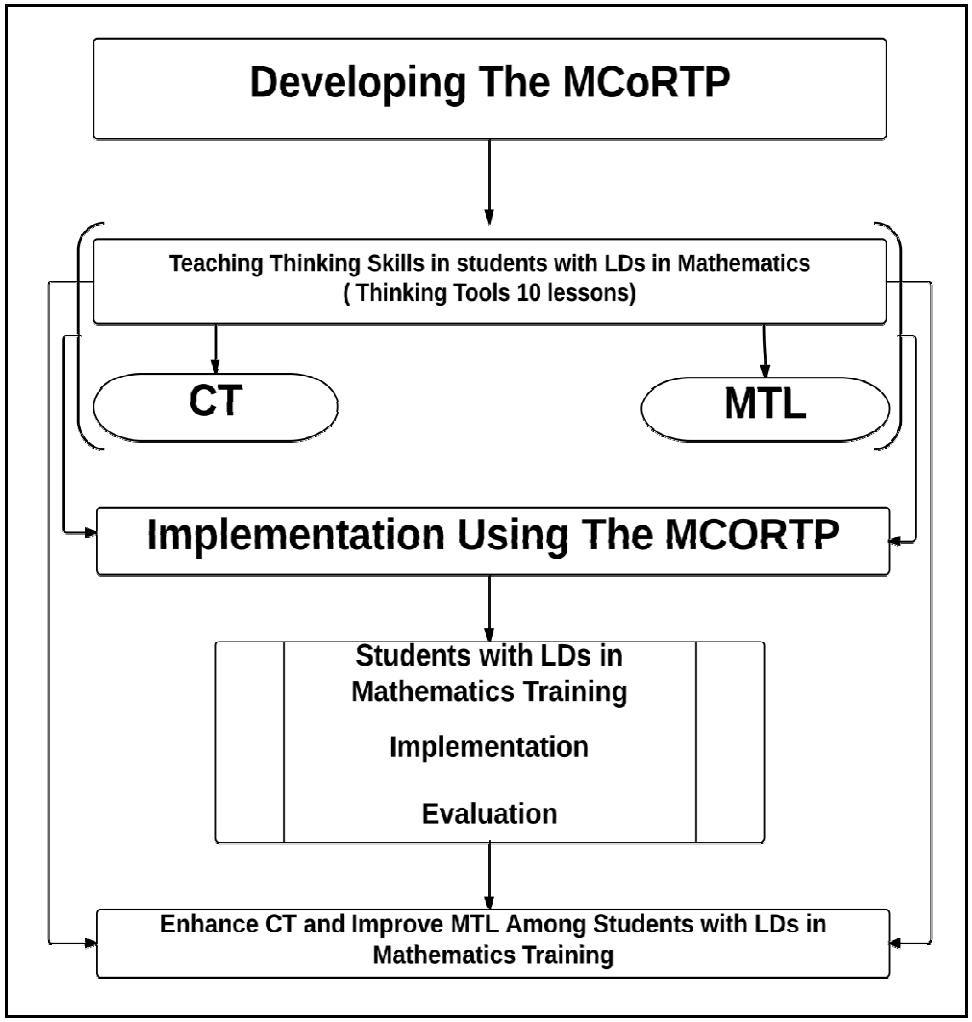

Figure 1.1 Conceptual framework

This framework was developed based on the great need for sound research in Jordan into this thinking skills via the MCoRTP due to lack of thinking programmes which are provided towards this category of the society. Most programmes that have been carried out in most of the developed countries have been focused on gifted and ordinary students. Nevertheless, only a few of these programmes have been carried out towards student with LDs.

The conventional programmes which are provided to students with LDs in mathematics focused on basic skills, because of prevalent belief among educators that students with LDs in mathematics suffer of difficulties in these basic skills.

Whereas the fact is that students with LDs in mathematics lack of critical thinking skills and weakness of motivation to learn which are stumbling block in front their academic life. There is very limited information to show that attention is given to students with LDs in mathematics, and nothing has been said about training these students in matters relating to provision for thinking skills by thinking programmes not only in Jordan but also in many other countries.

1.10 Rationale Of The Study

This section will discuss the rationale for the study. The researcher focused on thinking skills and MTL among students with LDs in mathematics because no studies have been found related to the combination of thinking skills and MTL. Few studies have been conducted on the subject of thinking skills and MTL. Secondly, the real need for thinking skills and strategies, as well as how they can be taught, is considered one of the main objectives of education in the contemporary world. However, students with LDs in mathematics are not given adequate attention in terms of teaching thinking skills and focus is given only to gifted and ordinary students.

The capacity to think is considered a prerequisite for all segments of societies, with individuals who possess these capacities considered independent thinkers who have control over their lives and have a sense of awareness of social, economic, and political aspects of everyday life. Individuals taught to think are given the right tools to make better judgments based on certain criteria, and thus often conscious attitudes as well as better judgment and values based on specific criteria, and based on life standards (Paul, 1984). In the same context, M. Khatib and Nazari (2012) reported that CT is deemed a vital and important topic that have preoccupied educational officials in the past and present due to its significance in enabling learners to develop basic skills of learning in education. The importance of these aspects shows the

tendency of educators with different scientific positions to adopt strategies of teaching and learning CT skills.

Educators generally agree that the main aim for teaching and learning of CT is the improvement of a student's thinking skills to ensure their success in various aspects of their lives and to encourage in the students a spirit of inquiry, research, question, and investigation and exploration of facts (al-Manea, 1996; Barry, 2001; Bashiwh, 2004; Cotton, 1991; Deway, 1933; R. H. Ennis, 2003; Facione, 2006; Jarwan., 2007; Khatib & Nazari, 2012; Patel, 2010). Students equipped with adequate CT skills can broaden their knowledge, and push towards expanding scientific research, thereby increase the learning qualities they possess and further improving their capacity to think (Nofal & Mari, 2007).

However, the barrier between students with LDs in mathematics and their aspiration to address difficulties effectively should be broken to enable these students to use their thinking skills properly. Equally, teaching thinking and improving the MTL among students with LDs in mathematics may facilitate their problem with ordinary programmes, and contribute to increasing their motivation that could in turn reinforce their self-confidence. The motivation of this study is the need to enhance and train students with LDs in mathematics on thinking skills and raise their motivation by training them on CoRT programme in learning resource rooms at ordinary schools.

To sum up:

1. The pressing need for a comprehensive reform of student with LDs in mathematics education and immediate attention to teach thinking skills to them.
2. Correction of the prevalent belief in the field of special education that students with LDs have a more urgent need to master basic skills, such as learning to read

and write. Thus, teaching thinking skills is not considered a priority in the field of special education.

3. The real need for skills and thinking strategies and how they can be taught is considered one of the main objectives of education in the contemporary world.
4. Students with LDs are not given adequate attention in terms of teaching thinking skills and focus is given only to gifted and ordinary students.
5. The dearth of literature which deals with the issue of teaching thinking skills towards students with LDs especially in Arab environment.

1.11 Significance Of The Study

The significance and benefits that this study hopes to achieve are discussed in detail below.

1.12 Theoretical Significance

Information pertaining to the actual status of educational services offered for students with LDs in mathematics to develop thinking skills is severely lacking, particularly in the Arab world. In general, this study aims to enrich the literature on developing thinking skills for students with LDs in mathematics, particularly in enhancing CT skills and improving their MTL. This study is also the first of its kind to use de Bono's CoRT Programme to teach thinking skills and develop CT skills and MTL for students with LDs in Jordan and the Arab world.

1.13 Practical Significance

The practical significance of the study can be addressed in six aspects. First is the success of training of thinking skills programme, which is argued to be successful because the programme addresses the educational needs of students. Second, training on thinking skills might motivate and help students improve at resolving trivial